History of the Department of Ceramic Engineering

The department was founded largely due to the efforts of Edward Orton, Jr. who was the son of Dr. Edward Orton and Mary Jennings Orton and was born at Chester, N.Y., October 8, 1863. He was taken to Yellow Springs, Ohio, when his father became principal of the preparatory school of Antioch College in 1865. He doubtless learned geology at his father's knee, as "Dr. Orton's geological work at Antioch received official recognition in 1869 when he became one of the two principal assistants to the State Geologist of Ohio, Dr. J.S. Newberry." As a lad of nine years of age, he saw his father become President of Antioch College and a year later inducted as the first President of the newly established Ohio State Agricultural and Mechanical College, as well as its professor of geology, mining and metallurgy. It will thus be seen that geologic science and administrative art entered early into his life.

Boyhood and College Days

From 1873 to 1877, he attended the public schools of the city of Columbus. At fourteen years of age he entered the Preparatory Department of the Ohio State Agricultural and Mechanical College, being the 238th matriculant, and was transferred to the Collegiate Department in 1881. Living with his father in the President's residence at the Fifteenth Avenue entrance to the campus, he had exceptional opportunities to see the normal life of a gentleman, an educator, a scientist, and an administrator, and to meet many prominent men in those walks of life.

One day in the fall of 1878 he heard George D. Makepiece play a cornet in the "old north dorm" and was so pleased that he bought for himself a cornet which Makepiece taught him to play. "With a vision of a university band, he brought together early in 1879 the students who could play band instruments, and an organization was formed with Makepiece as the first leader and instructor. Three students had played in bands before and three owned their instruments; the others were supplied with second-hand instruments purchased with a fund voted by the trustees." The band with a membership of sixteen students made its "first public appearance at the reception following the graduating exercises of the class of 1879." Young Orton was its second leader. He was also a "notable contestant" in the Class-day athletic contests.

" In his junior year, he prepared a report on the clays of Ohio, which was published in Vol. V of the reports of the Geological Survey of Ohio." His graduation thesis was entitled "Plans and Specifications for a Fire-Brick Factory." He had been trained under the late Professor N. W. Lord, E.M., and was graduated as an Engineer of Mines in 1884 before his twenty-first birthday.

Engineer

From 1884 to 1888, he was employed as chemist and superintendent of iron and coal mines, and of blast furnaces in the Hocking Valley. In 1887-88, at the Bessie furnace at New Straitsville, he became the first regular manufacturer in the United States of ferrosilicon as a high-silicon alloy of iron. In 1888, he entered the clay industry and managed several plants during the next five years.

"About 1890 he became superintendent of a plant manufacturing paving bricks. The plant had been unprofitable and he began at once to study the problems involved and found no helpful literature on the subject in the English language." Young Orton applied the principles which he had learned in mine engineering from Professor Lord to the winning of clays, but he sadly missed the technical literature on clayworking and ceramics of the kind that he had been accustomed to use and study in connection with the metallurgy of iron. Technical problems in ceramics at that time were solved by common sense and gumption and by the rules of thumb and of trial and error, rather than by the laws of physics and engineering applied to chemistry. Chemical engineering had been but recently recognized as a profession and ceramic engineering had not yet been born.

Originator of a Department of Education

He was next employed to prepare a revised and enlarged report of the clay-working industries of Ohio, which appeared in Volume VII of the Ohio Geological Survey Reports. "In the preparation of this revised report, he traveled all over the State, met all the clay-workers and came into contact with the brightest and best trained men in the industry. In collecting information from this broad circle, he found not only a woeful deficiency in knowledge of the subject of clay manufacture but also that the limited literature on the subject was of very little practical value to a clay-worker struggling with even the ordinary problems of manufacture. It seemed to him that the situation was one for which a remedy should be sought."

He was so appalled by the absence of technical data and literature that in 1893 he "began the agitation, first with the Ohio Brick and Drain Tile Association, and later with the National Brick Manufacturers Association, which resulted in his drafting a bill which was introduced into the House on February 22 and became a law on April 20,1894." The act required "The Board of Trustees of The Ohio State University to establish in said University a department of ceramics, equipped and designed for the technical education of clay-, cement-, and glass-workers." "In the preparation and introduction of the bill, and in securing favorable consideration of it by the legislature, he was practically unaided by anyone connected with the University. He alone was responsible for it." The act detailed just what instruction was to be given in both classroom and laboratory work. The act also provided that the department should have "an efficient laboratory designed especially for the practical instruction of clay-workers ... and also equipped to investigate the various troubles and defects incident to every form of clay-working which cannot be understood, or avoided, except by use of such scientific investigation." It further specified that the laboratory was "to be equipped with apparatus for chemical analysis, with furnaces and kilns for pyrometric and practical trials, with such machinery for the grinding, washing, and preparation of clays for manufacture as is consistent with the character of the department." It is noteworthy that Orton had the foresight to include provision for education in cements and glass, when these materials were not generally thought of as ceramic. Perhaps significant is the respected use of the phrase "clay working."

"The Act also provided for the appropriation of $5000 for the organization, equipment, and maintenance of the department for the current year and the sum of $2500 annually for two years for the salary, supplies, and all other expenses for maintenance of the department."

"The Trustees of the University noticed the introduction of the bill, and, seeing that it provided for an appropriation to carry out its provisions, took no further interest in it. No one in the University seemed to have any idea of its scope and purpose, or of the beneficient results which were to flow from it. There was no precedent for it, no department like it in any educational institution in this country, or in the world so far as known."

In this, his first known personal contact with the Legislature, he did a complete job of engineering, as the act specified in detail exactly what was to be taught in classroom and laboratory, how it was to be taught, and included the appropriations of $5000 for equipment and $2500 annually for two years for salary and supplies.

As the steps were mandatory, the Board of Trustees met on May 26, 1894, and elected Edward Orton,Jr., to organize the department. His paid services to the University began July 1,1894. His first title was "Director of the Department of Ceramics." "On June 27, 1894 the department was temporarily located at Orton Hall." There it remained until it was moved in 1904-5 to more commodious quarters in the Mining Building known as Lord Hall, and which were planned by him.

President W. H. Scott, in his annual report for the year ending June 30, 1894, mentions the act providing for the department and the

election of Mr. Orton as its director and states that "he is more thoroughly versed than anyone else in the localities and qualities of Ohio clays, and has a practical acquaintance with clay-working in several of its branches;... that a two-year course of study has been provisionally announced;... and that the department will be ready for the reception of students at the opening of the University in the fall."

Later in 1894, he was appointed "Director of the Department of Clayworking and Ceramics." In 1894-95 he gave three five-hour courses to the Short-Course students, one course in "qualitative analysis of the bases" in the second term of the first year, and one laboratory course in advanced chemistry and one in ceramics to second-year students. It should be remembered that when he began to teach in 1894, there were no text-books on any branches of ceramic engineering. His first courses were on elementary chemistry applied to the silicates. Furthermore, there was no literature on the subject to which students and instructors could be referred. He was a pioneer scholar in that branch of engineering as well as an investigator.

The department was opened in September, 1894, and eleven first-year short-course students were enrolled. In 1895-96 there were nine first-year students and six second year students.

Director Orton was successful in obtaining much machinery for clay-working and clay-burning from manufacturers and users so that from the very start the work of the department has been a success.

"The legislature which met in January, 1896, having increased the State levy for the support of the University from one twentieth to one-tenth of a mill, refused to make any appropriations whatever in addition to the sums raised by such appropriated annually for two years, for salary and supplies for the department was refused."

Since then, the department has been "maintained by the University out of its general income."

From the first, students of ability and purpose were attracted to the department of ceramics. It was soon seen that the venture in education was going to be a success and that one man could not give all the instruction, teach all the laboratory work in applied chemistry, and install all the machinery which was being donated by interested persons and companies. "For the year 1896-97, the Trustees made provisions for the salary of the director of the department, appropriated $300 for apparatus and supplies, made provisions for assistance for the director, and elected William Lloyd Evans,[5] as assistant in ceramics." Evans thus became America's first collegiate instructor in ceramic chemistry. Evans later became Chairman of the Department of Chemistry and author of several text books on chemistry. A notable group of men were attracted to the work being done by Professor Orton, first as students and later as instructors. The degree of "Engineer of Mines in Ceramics" was conferred first upon Walter M. Fickes in June, 1900. He was the first student in this country to receive such a degree.

During the years 1908-10, two members of the faculty served as "Acting Dean" and others occasionally served as chairman of the faculty meetings. In 1910, Professor Edward Orton, Jr., was again appointed Dean of the College of Engineering and served with great credit and distinction until 1915, when he was granted a year's leave of absence by the Board of Trustees.

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5. "William Lloyd Evans-America's First Instructor in Ceramic Chemistry", Bulletin American Ceramic Society 4 (2) p. 56-57 (1925).

On December 3, 1907, the Faculty recommended the abolishment of the degree of "Engineer of Mines in Ceramics" and that hereafter the degree should be that of "Ceramic Engineer." Numerous changes in the course in ceramic engineering were offered at that time. The short course was abolished in 1918.

Pertinent to these changes is the statement of Professor Orton before the American Ceramic Society Meeting in 1904 in which he said "In the Ohio State University, we have organized the work in Applied Chemistry into three parallel courses, each leading to a degree. First, the course in metallurgy, covering the extraction of metals from their ores. Second, the course in ceramics, covering the technology of the silicate industries, claywares, glass and cement. Third, chemical engineering, covering the manufacture of all other products of a chemical nature not included in the two preceding." It should be noted that the concept of ceramics had by then been broadened to include the silicate industries in general.

The history of the Engineering Experiment Station began with the appointment in February, 1911, of a committee by Dean Orton with Professor N.W. Lord as Chairman, to "consider the desirability of establishing an Engineering Experiment Station in connection with The Ohio State University and report to the Engineering Faculty its conclusions and recommendations concerning the same." In his report for 1911 to the President, Dean Orton presented the arguments for the establishment of an Engineering Experiment Station. He "then proceeded to explain how the organization of an engineering experiment station, with provision of substitutes for instructors released for research and of special apparatus and equipment, would make it

possible to undertake this service."

"This proposition bore fruit, for, in April, 1913, a bill introduced by Senator Hudson, passed the Eightieth General Assembly authorizing the establishment of such a station, but for lack of funds nothing further was accomplished until 1915, when the station was organized and an Advisory Council appointed by the President." Dean Orton was instrumental in securing an appropriation of $1000 in 1915 and a similar appropriation which was made and distributed among the departments the following year.

At a later date (1927) a ceramic research section of the Experiment Station was organized under the direction of Dr. G. A. Bole who had been on the faculty of Alfred University, and on the staff of the United States Bureau of Mines. The majority of the ceramic research on the campus was conducted in the Experiment Station under Dr. Bole and Dr. J. O. Everhart who became Chairman of the Department in 1960.

ARTHUR SIMEON WATTS ERA

Athur Simeon Watts, a fine scholar, a great friend, and a grand gentlemen, followed Orton as Head of the Department and served with vigor in this capacity from 1915 to 1946. His emminence in the field of ceramics is testified to by his presidency of and life membership[6] in The American Ceramic Society, 98 technical articles and eight patents.

Watts discusses the development of the ceramic course to meet the demands of the industry in several publications.

6. "Arthur Simeon Watts", Bull. Amer. Ceram. Soc. 25 (7) p. 244 (1946).

In 1923[7], "The original four-year course consisted of approximately fifty per cent fundamentals, 25% advanced general engineering and 25% fundamental and advanced ceramics. Individual courses in the curriculum have been changed but always in kind and the course at present consists of forty-five per cent fundamentals, including culturals, twenty-five per cent advanced engineering and thirty per cent ceramic engineering.

The most important additions to the curriculum within the Ceramic Engineering Department were the application of Physical Chemistry to Ceramics,introduced in 1910, the courses in Ceramic Machinery and Factory Design, introduced in 1911, the course in Refractories and Furnaces, introduced in 1918, and special post graduate courses in Ceramics, introduced in 1917. The most notable additions to the curriculum from outside the Department are the courses in fundamental Physical Chemistry, in Fuels, in Mineralogy and in Pyrometer Construction and Operation.

The object of the curriculum is strictly professional. It does not give nor pretend to give manual skill in any of the practical arts of modeling, forming or decorating. It is a study of the technology-the engineering, which is used in the clay and allied silicate industries.

The development of ceramics has made it impossible to cover the field in more than a general manner in the time available in a four year course.

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7. "Department of Ceramic Engineering, The Ohio State University", Jour. Amer. Ceram. Soc. 6 (1) p. 88-90 (1923).

In 1925[8], "The Ohio State University Bulletin of the College of Engineering of which the Department of Ceramics is a part states:

The purpose of the College of Engineering is to instruct students in the fundamental sciences and arts, upon which all engineering rests and to impart such special and technical knowledge of the various branches of engineering as will enable its graduates to maintain themselves while gaining their professional experience.

This statement establishes two facts: (1) the ceramic course as provided at present is intended to produce ceramic engineers. (2) The university does not pretend to produce a finished product, but only to furnish fundamental knowledge.

The university does acknowledge that the training provided shall be such as will enable the graduate to earn his wages during his period of training in the industry, and not be a burden to his employer during that period. To the industrial or engineering world, the sciences of chemistry, physics and mathematics are recognized as fundamental and essential, and in view of the limited training in rhetoric and grammar which our public schools provide, it appears necessary that these be given some place in any college training. Beyond these, what fundamental knowledge would the ceramic industry be justified in demanding of a ceramic graduate, whether he be an engineer,an artist or a scientist?

8. "The Development of a Ceramic Course to Meet the Demands of the Industry", A. S. Watts. Bull. Am. Ceram. Soc. 4 (2) p. 42-45 (1925).

In the consideration of raw materials, he should have the fundamentals of geology and mineralogy. In plant control and operation, he should have the fundamentals of mechanics, power generation, and power transmission. If he is to be useful in plant layout or development, a knowledge of drafting is necessary. To any educated man serving the ceramic industry, a knowledge of fuels and their combination is essential. All ceramic schools have found that these subjects are necessary regardless of the field of service into which their graduates go.

The university, therefore, has no choice but to insist that these subjects be properly provided for in its curriculum.

As a general assumption, we may say that all of the student's time, not required for the mastery of these fundamentals, should be devoted to such study as will equip him to serve the industry. The introduction of non-essential courses must be at the expense of the time otherwise devoted to ceramic instruction because educators have proved that to overload a student results in inferior training in all his work.

Most schools hold, however, that some non-essential courses are advisable because otherwise the student becomes lop-sided and cannot make proper contact with those outside his own field, and this opinion is strongly supported by all the large business organizations into which ceramic graduates go. Most schools demand a knowledge of surveying, and a majority demand training in foreign languages. In a majority of schools some time is allotted to the student's choice of subjects other than those prescribed.

In the five original ceramic schools, the essentials consume from 51% to 75% of the student's time, as indicated in Table I.

TABLE I

CERAMIC CURRICULA

Fundamentals	Ohio State %	Illinois %	Iowa State %	Rutgers %	Alfred %
Mathematics	14.0	13.3	15.0	11.5	13.5
Chemistry	13.0	16.2	14.0	17.0	15.5
Physics	8.0	8.0	9.0	4.0	8.5
English	4.0	4.4	6.0	6.0	1.5
Geology and Mineralogy	4.0	---	12.0	5.5	3.5
Mechanics-M.E. and E.E.	9.0	8.3	13.0	5.0	5.0
Engineering Drawing	7.0	6.0	6.0	3.0	3.5
Fuels	2.0	1.4	---	2.0	---
	61.0	57.6	75.0	54.0	51.0
Ceramics					
Ceramic Fundamentals	22.0	18.5	16.0	16.0	15.5
Ceramic Research	11.0	8.5	4.0	8.5	15.5
	94.0	84.6	95.0	78.5	82.0
Cultural and Electives					
Surveying	2.0	1.4	3.0	---	3.5
Foreign Language	---	6.0	---	10.0	8.5
Electives	4.0	8.0	---	8.5	4.5
Miscellaneous	---	---	2.0	3.0	1.5
	100.0	100.0	100.0	100.0	100.0

The allotment of the remaining time to ceramic fundamentals and research is also indicated in the same table. This brings us to the consideration of the subject before us. How can we best utilize this available time to meet the needs of the industry? The allotment of time to ceramic courses at Ohio State University is indicated in Table II.

No place is provided in the University schedule for manual training courses in ceramics or for a study of plant design and operation but these are provided for by the Ceramic Industrial Experience Courses and by the Plant Inspection Trips. The Industrial Experience Courses each require 10 weeks' plant experience in an approved plant, a written report of the work done and a statement from the employer that the services were satisfactory.

TABLE II

ALLOTMENT OF TIME TO VARIOUS CERAMIC COURSES AT OHIO STATE UNIVERSITY

Course No.		%
401	Origin, Occurrence and Phys. Properties of Clays,etc.	1.8
405	Mining, Preparation and Forming	2.2
601	Drying and Burning	2.2
605	Bodies, Glazes and Colors	1.8
610	Refractories and Test Furnaces	2.2
615	Ceramic Calculations	2.2
620	Testing of Clays, etc.	2.2
701 or 702	Research in Bodies and Glazes	4.4
703	Research in Colors	2.2
704	Research in Metal Enamels	2.2
705	Design-Plant Layouts	2.2

Course No.		%
706	Design-Driers	2.2
707	Design-Kilns	2.2
710 and 711	Thesis-Research	3.0
		33.0

Required Courses Outside Curriculum

430	Sophomore Summer Industrial Experience
431	Junior Summer Industrial Experience
630	Junior Factory Inspection Trip
631	Senior Factory Inspection Trip

The Plant Inspection Trips each require one week spent in visiting ceramic plants under the direction of an instructor and an examination covering the plant arrangement and processes observed. This course has been designed to produce ceramic engineers because the call has been for men with a broad ceramic training rather than for specialists.

The development of new curricula to produce ceramic artists and ceramic scientists or the modification of the present course to meet these needs and the alteration of our present curriculum to produce a better ceramic engineer are subjects that demand very serious consideration.[9]

Also in 1925, a statistical review of student enrollment, the distribution of graduates in the several branches of the industry, and the then current staff is given by Watts.[9]

9. "Survey of Ceramic Departments of the Universities-The Ohio State University, Bull. Am. Ceram. Soc. 4 (3) p. 113-114 (1925).

A complete alphabetically arranged list of present and past staff member of the Department, together with titles, is included as Appendix A of this report.

The period 1925-26 is especially noteworthy in that J. L. Carruthers, G. A. Bole and R. M. King, long and faithful members, joined the staff.

Professor King specialized in the fields of porcelain enamels and refractories, both teaching and directing research in these areas. His zeal for applying basic scientific principles in his work was both inspiring to his students and explains his many outstanding contribution to ceramic literature. Professor King was one of the original founders of the Shop Practice Forum and presented the Notable Lecture[10] on the Forum's silver anniversary.

While Professor Bole's principal duty was that of Director of Ceramic Research, Engineering Experiment Station, he also served as Research Professor in the Department. A pleasant characteristic, greatly appreciated by lackadaisical students, was his advance arrival notice as he was a habitual whistler of high skill. Dr. Bole's many practical contributions led to his presidency and life membership in The American Ceramic Society.[11]

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10. Notable Lecture Series-"Surface Phenomena", R. M. King. Proceeding of the Porcelain Enamel Institute Forum. Volume 25, pp. 1-18 (1963).

11. "Highest Ceramic Honor for Two Members", Bull. Am. Ceramic Soc. 39 (5) p. 285 (1960).

A bulletin[12] published in 1930 illustrates some of the equipment available in the Department at that time.

Professor Watts taught various courses relating to whitewares and at the time of his retirement, Dr. Ralston Russell Jr. was appointed as a Professor in the Department to carry forth such assignment and to supervise student research in this area. Dr. Russell is still very ably filling this role and in fact is rapidly approaching his predecessor's record as regards number of technical publications. Dr. Russell is a past president of the Institute of Ceramic Engineers.

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12. "School of Mineral Industries of the College of Engineering", The Ohio State University Bulletin, Volume XXXIV, June 10, 1930, Number 28.

JOHN L. CARRUTHERS'S CHAIRMANSHIP

John L. Carruthers was designated Head of the Department in 1946, continuing in that position until 1957. He served the ceramic field in many ways and for many years-in industry, in research and as president of The American Ceramic Society. He was awarded the title of Honorary Member[13] by The American Ceramic Society.

In 1948 all departments in the College of Engineering changed from a four to a five year program. More emphasis was placed upon high standards of student performance in the fundamentals of mathematics, chemistry, and physics with due regard for the necessity of satisfactory performance in English. Also, more humanity and social science courses were included in the curriculum for broadening student education. In the combined program it was feasible for the better students to obtain the M.S. as well as the B.Cer.E. degree in five years. A thesis was required for the M.S. but not for the B.Cer.E. degree.

Dr. Henry H. Blau joined the department just prior to Carruthers's administration. His assignment, for which he was eminently qualified, was to establish a Division of Glass Technology in the Department. He holds a B.S. degree in Chemical Engineering from Carnegie Institute of Technology, an M.S. degree in physical chemistry from Massachusetts

13. "Carruthers and Pearce Named Honorary Members", Bull. Amer. Ceram. Soc. 43 (4) p. 234 (1964).

Institute of Technology and a Ph.D. degree in organic chemistry from the University of Pittsburgh. This basic training coupled with industrial experience as an engineer, a researcher and as an executive, provided an excellent base for the important and desired course in Glass Technology. Dr. Blau has published many technical papers, holds numerous important patents and has been the recipient of high honors.[14,15,16] He retired in 1963.

Following service in the U. S. Air Force as a Second Lieutenant and research studies at the Engineering Experiment Station, Dr. Thomas S. Shevlin was designated an Assistant Professor in the Department from 1955 to 1961. He directed research principally relating to "cermets" and also taught courses regarding porcelain-enamels and ceramic tests and evaluations.

Dr. C. J. Koenig's affiliation with the University has been since 1935, except for the war years when in the Naval Reserve, completing the duty as a lieutenant commander. He became associated with the Department as a part-time Professor

14. "Henry H. Blau, 1962 Toledo Award Winner", Glass Ind. 43 (1) pp. 24, 25, 27 (1962).

15. "Dr. Blau Honored By Leading Ceramists-Industrials", National Glass. Budget 77 (43) pp. 6, 18 (1962).

16. "An Introduction to Dr. Henry H. Blau", The Ohio State Engineer, Vol. L (2) p. 80-20 (1966).

in the latter part of Carruther's administration. His duties at the University have largely related to research in diverse segments of ceramics. Coupled with part time appointments, as a Lecturer, he has directed research in industry and served in administrative capacities in industry and The American Ceramic Society. Full time duty now relates to research and teaching a course in Glass Technology.

JOHN OTIS EVERHART'S ERA

John Otis Everhart became the Acting Head of the Department in 1958 and was then designated Head of the Department in 1959. Having--been born and reared on a farm near Urbana,Ohio,- received four degrees from the Department, -directed research at the Engineering Experiment Station, Dr. Everhart truly reflects Ohio environment. His great interest in and dedication to the past, current and future stature of the Department reflects this background. He was connected in various capacities with the United States Steel Corporation from 1938 to 1944, when he returned to the University. Everhart has pioneered many practical advancements in ceramics, chiefly in the structural clay products field. He has been active in the American Society for Testing Materials and played a leading role in The Ohio Ceramic Industries Association. Following the high attainments of his predecessors in The American Ceramic Society, Everhart is currently serving as a Vice President.

The task facing Everhart upon assuming direction was formidable. Apart from continuing technical contributions, the Department was at a low ebb in it's outstanding history. Student enrollment had declined and equipment-wise the department had not

kept pace with many other ceramic departments. Everhart and his staff sought and obtained strong political and material support from ceramic manufacturers and suppliers in Ohio and elsewhere. By no means least fruitful, with the backing of the above, was the increase in the number of high caliber students enrolled in the Department.

Excerpts from a report[17] published by the American Ceramic Society are pertinent.

"Ground breaking ceremonies for the new Materials Engineering and Science Building at Ohio State University were held June 30 with state and school officials participating.

The new structure will be a part of a complex of engineering buildings, linking the structure which Chemical Abstracts Service, recently vacated, to the present chemical engineering building. The new 6-structure, to cost $2,390,000 is expected to be completed by February 1967.

The Department of Ceramic Engineering will occupy the basements, first and third floors of the Chemical Abstracts building and the new structure. The Mineralogy Department, closely associated with ceramic education, will have the second floor.

The remodelled Chemical Abstracts Building is expected to be ready for occupancy by Ceramic Engineering by late fall

17. "Ceramic Ground Breaking at Ohio State", Bull. Amer. Ceram. Soc. 44 (8) p. 653 (1965).

of this year. Ceramic tile and other ceramic materials are being used extensively in the remodelling.

"We will be crowded for space by the time we get into our new quarters," commented J. O. Everhart, chairman of the Department. Enrollment in the Department of Ceramic Engineering this fall will have more than 100 undergraduates and some 40 graduate students, nearly three times what it was four years ago.

In keeping with the modern quarters, an impressive array of research and testing equipment has been acquired. These are listed, along with some photographic illustrations, in Appendix C of this report. Needless to say, the much improved facilities are impressive to students, staff, and sponsors of research, student fellowships and scholarships. A notable addition to ceramics at Ohio State was achieved in 1965 by the establishment in the Department of a National Refractories Research Center jointly with The Refractories Institute.[18] The program was initially under the direction of Dr. Russell, assisted by George O. Harrell and working in close cooperation with the Technical Advisory Committee of The Refractories Institute. The program entails tests on refractories, development of new test procedures and requisite equipment, and research studies on refractories technologies with publication of results. Owing to Dr. Russell's heavy work load, Dr. A. J. Metzger was appointed in 1968 to direct the center, located in the basement of Lord Hall and also to teach

18. Refractories Institute Establishes Research and Testing Equipment at Ohio State University, Bull. Amer. Ceram. Soc. 44 (3) p. 277 (1969).

refractories and related subjects in the Department. In 1969 he also assumed the post of Chairman of the graduate program of the Department, a task which Dr. Russell had faithfully carried forth for so many years. While Professor Metzger acquired his several degrees at Ohio State, his background is diversified by virtue of broad experience in industry and by having served for many years as a Professor at The Virginia Polytechnic Institute. He also has held high positions in The Institute of Ceramic Engineers, The American Ceramic Society and The American Society of Testing Materials.

Dr. Everhart made the following appointments as retirement replacements or to further strengthen the Department.

Dr. William B. Shook joined the staff in 1965. Prior to this however he had been associated with the University as a student, as a staff member of the Engineering Experiment Station, being Director of Ceramic Research during the latter portion of this assignment, and as a representative at the Indian Institute of Technology, Kanpur, India. Dr. Shook teaches various courses relating to fundamentals of ceramic engineering, ceramic material science, plant design, and serves as an advisor for student research, course scheduling, and is Chairman of the undergraduate curriculum committee.

Dr. Burnham W. King became associated with the Department in 1962 on a part time basis and in 1966 on a full time basis. He

graduated from The Carnegie Institute of Technology, The Ohio State University and The University of Illinois and has a broad industrial and research background in the area of ceramic-metal systems. He holds many patents and has authored numerous articles. His departmental assignments principally relate to teaching and directing research relating to ceramic-metal systems .

Dr. Carl A. Alexander has been affiliated with the staff on a a part time basis since 1962. He specialized in mathematics and physics at Ohio University, then in ceramic engineering at The Ohio State University. He teaches courses in the important areas of thermodynamics of ceramic materials and advanced ceramic physics and chemistry. His concurrent related research activities at The Battelle Memorial Institute stand him in good stead for keeping fully abreast of current developments.

Dr. William B. Campbell joined the staff on a part time basis in 1966 while pursuing his doctorate. He previously received degrees from the Georgia Institute of Technology and Harvard University respectively specializing in ceramic engineering and mineralogy. Also while attending the Massachusetts Institute of Technology, he was affiliated with an industrial research laboratory. While teaching courses relating to thermo analytical techniques, ceramic rate processes and bioceramics. His chief duties now on a full time basis,reside in directing research.

Upon Dr. Blau's retirement in 1967, the Department was fortunate in obtaining the services of Dr. John F. G. Hicks on a half time basis. His diversified scientific training, organic chemistry - University of Washington, physical chemistry - University of California, thermodynamics - M.I.T., coupled with research,

engineering and administrative roles with the Manhattan Project, The Corning Glass Works and Battelle Memorial Institute provide a broad background. Dr. Hicks teaches courses and directs research in the area of glass.

A tabulation of the total number of degrees per year is given in Appendix D. The markedly increased number of degrees awarded in recent years reflects not only departmental activities but a broadened scope of the ceramic industry.

In the history of the Department only six persons have received all four degrees. i.e. B.Cer. E., M.S., Ph.D., and Cer. E. Such graduates are P. F. Collins, J. O. Everhart, C. J. Koenig, W. C. Ruechel, R. Russell, Jr., and G. H. Spencer-Strong.

While the significance is not clearly apparent, three graduates subsequently entered the Ministry. ("Mold me and make me, after thy will, thou art the potter, I am the clay")

Watts Hall and MacQuigg Laboratories were dedicated on May 12, 1967. Dr. Everhart[19] cited this as one of three historic events for the Department. "The first was its establishment by the State Legislature and location of its facilities in Orton Hall in 1894. The second was the move to new quarters in Lord Hall in 1906. During this very long time many great men have taught there, and an even greater number studied there. Obviously those of us who have taught or studied there have many fond memories of the old building. Pride in these new structures does much to offset the sorrow of departing from long familiar surroundings."

The 75th Anniversary of the founding of the department was celebrated on May 23, 1969.[20] Dr. Everhart introduced the program noting the advances in science and ceramic technology and the high caliber of young people needed to master this intricate profession.

Mrs. Edward Orton, Jr., widow of the Department's founder, spoke on early days as revealed in Dr. Orton's letters and other documents.

Featured speaker was Arthur J. Blume of American Olean Tile Co., a 1927 graduate of the Department and now president of the American Ceramic Society. His address "Four Generations," outlined the background of significant dates in the growth of the school, the community and the profession.

19"Ohio State Dedicates New Facilities", Bull. Amer. Ceram. Soc. 46 (7) p. 706 (1969).

20"Ohio State Ceramic Engineering Department Celebrates 75th Anniversary of Founding", Bull. Amer. Ceram. Soc. 48 (7) p. 748 (1969).

Two students discussed research in which they are engaged. "Ceramic Prosthetics" was by William Robertson and "Effects of Kiln Atmosphere on Whiteware Bodies and Glazes" was by J. Richard Schorr.

Harold A. Bolz, dean of the College of Engineering, spoke briefly in congratulations to the Department of Ceramic Engineering, and to its faculty and students.

DEPARTMENT OF CERAMIC ENGINEERING

Statement of Philosophies and Objectives of the Bachelor's Program (Four Year Curriculum)

Dominant objectives of the ceramic engineering curriculum are the development of a background in the utilization and control of high temperature reactions; in understanding the interrelationships among composition, processing, properties, and structure; and in understanding the engineering applications of ceramic products and materials. The ceramic materials considered cover the spectrum from glass to crystalline structures alone or in combination, or with other materials; with a range also in their applications based on mechanical, chemical, electrical, optical, and thermal properties.

Professional activities of ceramic engineers may be in one or more of the following general capacities:

1. production or development engineer in the ceramic manufacturing industries.

2. materials specialist in the industries utilizing ceramic materials.

3. research engineer workin on ceramic material development or application.

Flexibility in course offerings and content is obviously requisite to a curriculum which offers foundations for professional development in these areas. Accordingly, there are options provided which contain numerous suggested electives emphasizing either the engineering science or the analysis and design aspects of the program.

The balanced offerings of laboratory experience in several principal areas of ceramic technology, and in the fundamental areas of preparation, forming, and thermal processing, are a continuation of curricular practices which have gained a high reputation for ceramic engineering graduates from this institution. The distribution of instruction to the areas of basic sciences, engineering sciences, general educational development, and ceramic engineering analysis and design is very close to that recommended by the ASEE-sponsored report, "Objective Criteria in Ceramic Engineering Education".

Appendix A-Staff Members

(History of the Department of Ceramic Engineering)

Dr. C. A. Alexander, Lecturer, part-time, 1962; Adjunct, Assistant Professor, part-time, 1963 to date.

Dr. H. H. Blau, Professor, part-time, 1945-1963; Professor, 1963-1967; Emeritus Professor,1967 to date.

Dr. A. V. Bleininger, Laboratory Assistant in Ceramics, 1898-1899; Assistant in Ceramics, 1901-1904; Assistant Professor, 1905; Associate Professor, 1906.

Dr. G. A. Bole, Research Professor, 1926-1954.

Dr. I. L. Brandon, Teaching Assistantship, 1966.

Dr. W. B. Campbell, Teaching Assistantship,1966; Assistant Professor 1967-69; Associate Professor, 1969 to date.

J. L. Carruthers, Assistant Professor 1925-1930; Associate Professor 1930-1936; Professor 1936-1960; Head of Department 1946-1957.

W. L. Evans, Assistant in Ceramics, 1896-1897.

Dr. J. O. Everhart, Professor, Acting Head of Department, 1958. Head of Department 1959 to date.

T. N. Felton, Assistant Professor, 1927-1928.

Theodore Griffin, Assistant in Ceramics, 1898-1899.

G. O. Harrell, Instructor 1965-1966.

C. B. Harrop, Assistant Professor, 1911-1923.

Dr. John F. G. Hicks, Adjunct Professor, 1967 to date.

Dr. B. W. King, Jr. Lecturer, part-time, 1962-1963. Assistant Professor, part time, 1963-1967; Assistant Professor, full-time, 1967-1969;Associate Professor 1969 to date.

R. M. King, Assistant Professor 1926-1936, Associate Professor 1936-1944, Professor 1944-1960. Emeritus Professor, 1960 to date

J. C. Lysatt, Mechanician

J. H. Knote, Laboratory Assistant, 1907.

Dr. C. J. Koenig, Professor 1956-1960; Lecturer, part-time 1960-66; Adjunct Professor 1967-1969; Professor 1969 to date.

Appendix A-Staff Members (cont'd).

Louise (Luff) Liddil, Secretary, 1924-1968.

D. McSweeney, Lecturer, part-time, 1929-1931.

Dr. A. J. Metzger, Professor 1968 to date.

Edward Orton, Jr. Professor, Head of Department, 1895-1914.

F. K. Pence, Professor, 1912

S. V. Peppel, Assistant in Ceramics 1901.

A. P. Potts, Assistant in Ceramic Engineering, 1911.

R. C. Purdy, Assistant in Ceramics, 1903-1905; Assistant Professor 1907. Associate Professor 1908-1910; Professor 1911; Acting Head of Department, 1909.

F. H. Riddle, Laboratory Assistant, 1906.

J. T. Robson, Instructor, 1919-1925.

Dr. R. Russell, Jr., Professor, 1946 to date.

J. H. Saling, Ceramic Technician, 1947 to date.

S. R. Scholes, Lecturer, part-time, 1925-1926.

J. E. Seaver, Ceramic Technician, 1969 to date.

Dr. T. S. Shevelin, Assistant Professor 1955-1961.

Dr. W. B. Shook, Assistant Professor, part-time, 1961; full-time, 1962; visiting Professor IIT Kanpur, India, 1963-65; Assistant Professor 1965-67; Associate Professor 1967 to date.

R. C. Sloane, Professor, part-time 1924-1926.

H. F. Staley, Associate Professor, 1910; Professor, 1911.

Dr. A. S. Watts, Professor 1913-1915, Head of Department 1915-1946.

Frank C. Westendick, Student Assistant 1925 1926, Instructor 1927.

Hewitt Wilson, Assistant Professor, 1917-1918.

W. G. Worcester, Laboratory Assistant, 1907-1909; Instructor 1910.

Appendix D Total Degrees per Year

Year	Degrees	Year	Degrees
1899	4	1941	22
1900	3	1942	18
1901	4	1943	12
1902	5	1944	1
1904	9	1945	3
1905	3	1946	7
1906	4	1947	21
1907*	7	1948	28
1909	16	1949	34
1910	13	1950	29
1911	10	1951	31
1912	8	1952	26
1913	8	1953	14
1914	6	1954	24
1915	7	1955	14
1916	6	1956	6
1917	5	1957	12
1918	4	1958	16
1919	6	1959	8
1920	9	1960	10
1921	2	1961	9
1922*	7	1962	11
1923	10	1963	18
1924	3	1964	14
1925	14	1965	18
1926	10	1966	34
1927	24	1967	31
1928	19	1968	33
1929	24	1969	46
1930***	24		
1931	27		
1932	24		
1933	30		
1934	20		
1935	16		
1936	20		
1937	17		
1938	27		
1939	36		
1940	29		

* First year for B. Cer. E.

** First year for graduate level degrees

*** First year for professional degree